United States Department of the Interior

U. S. GEOLOGICAL SURVEY
WESTERN FISHERIES RESEARCH CENTER
COLUMBIA RIVER RESEARCH LABORATORY
5501-A Cook-Underwood Road
Cook, WA 98605
(509) 538-2299

A. **Title:** Application for a Permit for Scientific Purposes under the Endangered Species Act of 1973, for the study, "Watershed Nutrient Enhancement."

B. **Species:** Lower Columbia River ESU steelhead (*Oncorhynchus mykiss*) and chinook salmon (*O. tshawytscha*) from the Lewis River watershed. Project activities involving take of these species in the Wind River watershed will occur under Permit 1135.

C. **Date of Permit Application**: February 23, 2004

D. **Applicant Identity:**

Dr. Alec G. Maule, Project Leader
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E. **Information on Personnel, Cooperators, and Sponsors.**

Lead Agency: U. S. Geological Survey
Western Fisheries Research Center
Columbia River Research Laboratory
5501-A Cook-Underwood Road
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Scientists: Dr. Alec G. Maule, Project Leader, Supervisory Physiologist (Research)
Dr. Matthew G. Mesa, Principle Investigator, Research Fishery Biologist
Dr. Patrick J. Connolly, Research Fishery Biologist
T. Craig Robinson, Fishery Biologist
Ian G. Jezorek, Fishery Biologist
M. Brady Allen, Fishery Biologist
Kyle D. Martens, Fishery Biologist

Cooperators: U.S.D.A. Forest Service, Gifford Pinchot National Forest Headquarters
(Contact: Diana Perez, (360) 891-5108)

Washington Department of Fish and Wildlife, Region 5
(Contact: Dan Rawding, (360) 906-6747)

U.S. Fish and Wildlife Service
Lower Columbia Fish Health Center
61552 State Route 14
Underwood, WA 98651
(Contact: Dr. Susan Gutenberger, (509) 493-3156)

Sponsor: Lower Columbia Fish Enhancement Group
2041 NE Birch Street
Camas, WA 98607
Phone: 360-817-9044
Email: cwfish@attbi.com
Contact: Tony Meyer

Disposition of Mortalities:
Incidental fish mortalities will be put on ice and delivered to the U.S. Fish and Wildlife Service's Lower Columbia River Fish Health Center, which will provide a thorough disease profile as part of the U. S. Fish and Wildlife Service's National Wild Fish Health Survey. See above for contact information.

F. **Project Description, Purpose, and Significance:**

1. The goal of the study, "Watershed Nutrient Enhancement," is to demonstrate the effectiveness of stream nutrient enhancement to restore juvenile salmonid production in watersheds previously identified as nutrient deficient. It is a follow-up to our low level water chemistry assessment of the Washougal, Lewis, and Wind River watersheds, conducted during spring through fall 2003. This project will consist of two phases. In Phase I, slated to begin in 2004, we will document the biological productivity of selected study sites sites during the spring through fall. This will include an assessment of periphyton, macroinvertebrate, and fish production (e.g., species composition, biomass, and growth). We will also collect information on low-level water chemistry and physical characteristics of these sites. This effort will produce the baseline information needed prior to starting Phase II, which involves placement of nutrient media in some of these same sites. For Phase II, scheduled to begin in 2005, we will place nutrient media (e.g., inorganic fertilizers or carcass analogs) in selected sections and will monitor the responses of periphyton, benthic invertebrates, fish, and water chemistry to this nutrient enhancement. In future years, we hope to continue a nutrient enhancement and monitoring project at these sites to fully understand the long-term influence of nutrient enhancement as a salmon restoration technique. Ultimately, we hope our information will help managers understand the feasibility of implementing nutrient enhancement as a salmon habitat restoration technique on a programmatic basis.

2. This study will investigate habitat needs outlined in the National Marine Fisheries Service 2000 Federal Columbia River Power System (FCRPS) Biological Opinion:

    - Sections 5.2.1 and 5.2.2 address critical habitat needs of listed salmonid species, including food availability, and need for more information regarding the relationships between critical habitat elements and species survival.
        - We will assess juvenile growth, development, and survival in rearing areas and migration corridors in response to increased food availability through nutrient enhancement.

    - Sections 9.1.3 and 9.6.2 recognize the need to improve "offsite" habitat in tributaries to the Columbia River hydrosystem.
        - We will investigate the ability of nutrient enhancement to improve conditions in tributary habitat through enhanced food availability.

3. This study proposes to investigate the efficacy of nutrient enhancement to stimulate primary and secondary productivity in Southwest Washington

streams, and thereby increase growth and condition of juvenile fish. Enhanced growth and condition of juvenile fish would likely increase over-winter survival, smolt outmigrations, and adult returns. After continuing this cycle for a number of years, the need for nutrient enhancement efforts should decrease as salmonid runs become self-sustaining and the ecosystem begins to function naturally. Nutrient enhancement is one of many techniques being used to help restore salmon populations in the Pacific Northwest, and we wish to evaluate its utility in restoring select steelhead populations in the Lower Columbia River ESU.

4. Our group has consulted with other investigators of nutrient enhancement within the Columbia River Basin, and looks forward to continued interactions to refine these techniques for future use. In particular, we have consulted with the following BPA-funded projects: Project 2001055: *Influences of Stocking Salmon Carcass Analogs on Salmonids in Yakima River Tributaries*; Proposal 22047: *Salmonid Response to Fertilization: An Experimental Evaluation of Alternative Methods of Fertilization*; Project 199801901: *Wind River Watershed Restoration Project*.

5. Our primary response variables for assessing the efficacy of nutrient enhancement will be the abundance and growth of juvenile salmonids in our treatment site sections. To obtain baseline information on growth and abundance of fish in our sections, we will conduct a series of extensive and intensive electrofishing surveys of study sections to determine species composition, abundance, growth, and movements. Growth and movements of individual salmonids will be determined from recapture information from consecutive electrofishing surveys.

G. **Project Methodology:**

1. Project duration: May 2004 to December 2006

2. Extensive sampling, which will consist of relatively rapid, single-pass electrofishing efforts in 250-m stream sections, will be performed once each in June-July, October, and the following March-April. The purpose of the extensive sampling is to capture and mark individuals (see below), measure their growth rates, and track their movements in and out of the study sections. Intensive sampling will be performed in August-September to obtain a population estimate of fish within the study sections. During these efforts, the 100-m section of interest will be blocked with nets at the upstream and downstream boundaries. A backpack electrofisher will be used to conduct three or more passes using the removal-depletion methodology (Zippin 1956, Bohlin 1982, White et al. 1982). The field guides of Connolly (1996) will be used to ensure that a pre-determined level of precision for the population estimate is

achieved (generally, coefficient of variation no greater than 15%) within each sampling unit for each salmonid species. An electrofishing pass will consist of a methodical upstream effort followed by a relatively rapid downstream effort. Care will be taken to minimize stress and injuries to captured fish by use of state-of-the-art electrofishing equipment with settings appropriate to stream conditions, quick removal of stunned fish from the electrical field, and timely data collection from and release of captured individuals. We will comply with NOAA Fisheries' backpack electrofishing guidelines for collection of ESA-listed fish.

All fish captured during electrofishing will be held in buckets filled with fresh water, anesthetized in 50-70 mg/L tricaine methanesulfonate (MS-222), identified to species, and measured for weight and length. All salmonids collected will be marked with a visual implant tag (elastomer dye), and larger individuals (> 80 mm) will also be implanted with PIT tags. Anesthetized fish will be allowed to regain equilibrium in a freshwater recovery bucket before release to the site from which they were collected. Growth and movements of individual salmonids will be determined from recapture information from consecutive electrofishing surveys. All PIT-tag data will be entered in the PITAGIS database, which is maintained by Pacific States Marine Fisheries Commission. The ISO FDX-B, 134.2 kHz (12 mm) PIT tags that we use will be detectable at Bonneville Dam in the event that these tagged fish migrate downstream and exhibit an anadromous life history.

Incidental fish mortalities (not to exceed 5%) will be put on ice and delivered to the U.S. Fish and Wildlife Service's Lower Columbia River Fish Health Center, which will provide a thorough disease profile as part of the U. S. Fish and Wildlife Service's National Wild Fish Health Survey (see contact information in Section E). These data will provide an important baseline on the health of existing fish populations in the selected sites.

H. **Description and Estimates of Take:**

1. The targeted species of this study is juvenile Lower Columbia River ESU steelhead (*Oncorhynchus mykiss*) from the Lewis River. Incidental capture of adult steelhead and juvenile Lower Columbia River ESU chinook salmon (*O. tshawytscha*) may occur as well. Project activities involving take of these species in the Wind River watershed will occur under Permit 1135.

2. Sampling in the Lewis River (East Fork Lewis and Rock Creek) watershed will be sited and timed to maximize the targeted capture of the species of interest. In June/July we hope to mark as many 1+ and older steelhead as possible. Sampling in August/September will allow us to obtain a population estimate of 0+ and older steelhead within the study sections. Sampling in October and the

following March-April will provide us with growth and abundance data on marked fish before and after the winter season.

3. In the Lower Columbia River ESU, steelhead were listed as a threatened species on March 19, 1998, and chinook salmon were listed as a threatened species on March 24, 1999. On April 30, 2002, the NMFS withdrew critical habitat designations from these and other ESA-listed Pacific salmon stocks in order to do a more thorough analysis of the economic impacts of these designations. Federal status information was obtained from NOAA Fisheries' Endangered Species Act Status Reviews And Listing Information web site (http://www.nwr.noaa.gov/1salmon/salmesa/).

   The Washington Department of Fish and Wildlife (WDFW) has classified winter and summer steelhead in the Lewis River watershed as depressed. A depressed stock is one whose production is below expected levels, based on available habitat and natural variation in survival rates, but above where permanent damage is likely. Washington State classification information obtained from the WDFW Salmonid Stock Inventory web site (http://wdfw.wa.gov/fish/sassi/intro.htm).

4. For estimated take see Tables 1 and 2.

5. Estimated maximum mortality from our collection activities will be 5% of juveniles (Tables 1 and 2). Such a rate would result in the following figures for Lower Columbia River (LC) ESU steelhead and chinook salmon.

   Lewis River watershed:
   - *Phase I (May 2004 to April 2005):*
     - 300 juvenile LC steelhead
     - 10 juvenile LC chinook salmon
   - *Phase II (May 2005 to April 2006):*
     - 300 juvenile LC steelhead
     - 10 juvenile LC chinook salmon

   We also estimate a maximum of 5 adult LC steelhead will be captured, handled, released. We will take care not to electrofish where adults are obviously present so as to avoid this incidental take. All mortalities (juvenile and adult) will be delivered to the U.S. Fish and Wildlife Service's Lower Columbia River Fish Health Center, which will provide a thorough disease profile (see contact information in Section E).

6. Mortality for similar sampling activities by the Columbia River Research Laboratory in the Wind River watershed has consistently been under 5%.

I. **Transportation and Holding:** NA

J. **Cooperative Breeding Program:** NA

K. Previous or Concurrent Activities Involving Listed Species: NA

L. **Certification:**

I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand this information is submitted for the purpose of obtaining a permit under the Endangered Species Act of 1973 (ESA) and regulations promulgated thereunder, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or to penalties under the ESA.

_____ _____

Signature Date

Dena Gadomski
Research Fishery Biologist
ESA Coordinator

Table 1. Estimated take of Lower Columbia River (LC) Evolutionarily Significant Units (ESU) of steelhead (*Oncorhynchus mykiss*) and chinook salmon (*O. tshawytscha*) from the Lewis River watershed in Phase I (May 2004 to April 2005).

Number of individuals	Species and/or Population and/or ESU	Life Stage	Take Activity Category
Lewis River watershed:			
6000	steelhead (LC)	juvenile	Capture, measure, weigh, tag, release
300	steelhead (LC)	juvenile	Indirect mortality
5	steelhead (LC)	adult	Capture, handle, release
200	chinook salmon (LC)	juvenile	Capture, measure, weigh, tag, release
10	chinook salmon (LC)	juvenile	Indirect mortality

Table 2. Estimated take of Lower Columbia River (LC) Evolutionarily Significant Units (ESU) of steelhead (*Oncorhynchus mykiss*) and chinook salmon (*O. tshawytscha*) from the Lewis River watershed in Phase II (May 2005 to April 2006).

Number of individuals	Species and/or Population and/or ESU	Life Stage	Take Activity Category
Lewis River watershed:			
6000	steelhead (LC)	juvenile	Capture, measure, weigh, tag, release
300	steelhead (LC)	juvenile	Indirect mortality
5	steelhead (LC)	adult	Capture, handle, release
200	chinook salmon (LC)	juvenile	Capture, measure, weigh, tag, release
10	chinook salmon (LC)	juvenile	Indirect mortality

Literature Cited

Bohlin, T. 1982. The validity of the removal method for small populations – consequences for electrofishing practice. Institute of Freshwater Research Drottingholm Report 60:15-18.

Connolly, P. J. 1996. Resident cutthroat trout in the central Coast Range of Oregon: logging effects, habitat associations, and sampling protocols. Doctoral dissertation. Oregon State University, Corvallis.

White, G. C., D. R. Anderson, K. P. Burnham, and D. L. Otis. 1982. Capture-recapture and removal methods for sampling closed populations. No. LA-8787-NERP, UC-11. Los Alamos National Laboratory, Los Alamos, New Mexico.

Zippin, C. 1956. An evaluation of the removal method of estimating animal populations. Biometrics 12:163-189.